

CLAIMS

WE CLAIM:

1. A method for ablating a volume of tissue in a patient comprising the steps of:
 - (a) radially extending a first plurality of electrode wires at a first position adjacent the volume of tissue to radial points defining a first plane;
 - (b) radially extending a second plurality of electrode wires from a second opposing position adjacent the volume of tissue to radial points defining a second plane, offset from the first plane; and
 - (c) connecting a power supply between the first plurality and second plurality of electrode wires to induce a current flow between them through the tumor volume.
2. The method of claim 1 wherein the first and second plurality of electrode wires are umbrella electrode sets having at least three radially extending electrode wires.
3. The method of claim 2 wherein the three radially extending electrode wires in the first set of electrodes are aligned with the corresponding radially extending electrode wires in the second set of electrodes.
4. The method of claim 3 wherein the oscillating electrical voltage has an energy spectrum substantially concentrated in frequencies below 100 kHz.
5. The method of claim 1 wherein each of the first and second sets of electrode wires are selectively extendable from a shaft.
6. The method of claim 1, further comprising the step of monitoring a temperature level at each of the first and second pluralities of electrode wires.
7. The method of claim 1, wherein the steps of radially extending the first and second electrode sets comprises radially extending the wires of the first and second electrode sets at radial points separated by substantially equivalent angles.

8. The method of claim 1, wherein the first and second electrode sets are tripartite, and the steps of radially extending the first and second electrode sets comprise radially extending the tripartite electrode such that each of the wires in the tripartite electrode is offset from another of the wires in the tripartite electrode by substantially one hundred and twenty degrees, and the tripartite electrode of the first electrode set is substantially aligned with the tripartite electrode in the second electrode set.

9. The method of claim 6, further comprising the step of controlling a voltage applied between the first and second sets of electrodes to maintain the temperature within a predetermined temperature range.

10. A method for ablation of a tumor volume in a patient comprising the steps of:
- (a) inserting a first electrode having a first support shaft and a first umbrella electrode set percutaneously at a tumor volume so that the first umbrella electrode set is at a first location adjacent to the tumor volume and offset from a center of the tumor volume;
 - (b) inserting a second electrode having a second support shaft and a second umbrella electrode set percutaneously at a tumor volume so that the second umbrella electrode set is at a second location opposed and at a predetermined separation from the first location and about the tumor volume;
 - (c) extending the first and second umbrella electrodes sets radially from the first and second shafts to an extension radius wherein the electrode wires of the first umbrella electrode set are provided at radial points defining a first plane and the electrode wires of the second umbrella electrode are provided at radial points defining a second plane; and
 - (d) connecting a power supply between the first and second electrode umbrella sets to induce a current flow between them through the tumor volume whereby current induced heating is concentrated in the tumor volume defined between the first and second plane.
11. The method of claim 10 wherein each of the first and second umbrella electrode sets each include at least three electrode wires extending radially from the support shaft.
12. The method of claim 10 wherein the power supply provides an oscillating electrical voltage with an energy spectrum substantially concentrated in frequencies below 100 kHz.
13. The method of claim 10 wherein the oscillating electrical voltage has an energy spectrum substantially concentrated in frequencies below 10 kHz.
14. The method of claim 10 further comprising the step of aligning the first and second umbrella electrode sets.
15. The method of claim 11, further comprising the step of extending the at least three electrode wires at substantially equivalent angles.

16. An electrode assembly for ablating tumors in a patient comprising:
- (a) a support shaft sized for percutaneous placement in the patient;
 - (b) first and second wire electrode sets extensible radially from the shaft to an extension radius, the first wire electrode set being positioned adjacent to a tumor volume and offset from the tumor volume and offset axially along the support shaft from the second wire electrode set positionable at a second location opposed from the first location about the tumor volume, the wires of each of the first and second wire electrode sets being positioned at radial points around the support shaft to define a plane, wherein the first electrode set defines a first plane and the second electrode set defines a second plane axially offset from the first plane; and
 - (c) a power supply connected between the first and second electrode sets to induce a current flow between the first and second electrode sets, wherein the first wire electrode set is positionable adjacent to a tumor volume and offset from a center of the tumor volume and the second wire electrode set is positionable at a second location opposed from the first location about the tumor volume such that the current flow is through the tumor volume.
17. The electrode assembly of claim 16, wherein each of the electrode sets comprises at least three electrode wires.
18. The electrode assembly of claim 16, further comprising at least one temperature sensor coupled to each of the first and second electrode sets.
19. The electrode assembly of claim 17, further comprising a controller connected to the temperature sensor to receive temperature level signals from each of the first and second electrode sets and to the first and second electrode sets to control the applied voltage level as a function of the temperature level.
20. The electrode assembly of claim 19, wherein the electrode wires in each of the first and second electrode sets are electrically isolated, a temperature sensor is coupled to each of the wires in the electrode wire sets, and the controller monitors the temperature at each of the electrode wires and individually controls the voltage applied to the electrode wires.

21. The electrode assembly of claim 20, wherein the electrode wires in the first electrode set are axially aligned with the electrode wires in the second electrode set.

22. The electrode assembly of claim 20, wherein each of the electrode wires in the electrode set are offset at substantially equivalent angles around the support shaft.

26. A kit, comprising:
at least two electrode assemblies, each of the electrode assemblies comprising:
a support shaft; and
a first electrode and a second electrode set, retractably coupled to the support shaft, the first and second electrode sets being separated along the support shaft an axial distance and radially extendible to a radial distance from the support shaft;
wherein the axial distance and the radial distance of each electrode assembly provided in the kit is selected for ablating a tumor of a selected volume.
27. The kit as defined in claim 26, wherein the radial distance of each electrode assembly is less than four times the axial distance.
28. The kit as defined in claim 26, wherein each of the electrode assemblies is adapted to be connected to a power supply.
29. The kit as defined in claim 26, wherein the electrode wires in the first electrode set are aligned axially with the corresponding electrode wires in the second electrode set.
30. The kit as defined in claim 26, wherein the electrode wires in each of the first and second electrode sets are offset from adjacent electrode wires by a substantially equivalent angle.